Wave Rotor Combustor Aerothermodynamic Design and Model Validation

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Abstract

Wave Rotor Combustor Aerothermodynamic Design and Model Validation based on Initial Testing. Tests of combustion in a wave-rotor constant-volume combustor (WRCVC) provided a demonstration of the potential of pressure-gain combustion using a wave rotor. Experimental data showed good agreement with numerical model predictions, validating the aerothermodynamic design of the combustor and the numerical model used. A time-dependent, one-dimensional gas dynamic and combustion model used for design of the WRCVC is shown to capture major features and trends of the measured gas dynamic and combustion processes. Experimental test cases with different configurations are shown and the results are analyzed and compared to the numerical simulations to calibrate the numerical model. Simulations discussed in the paper illustrate the likely explanations for test cases with and without evidence of combustion, and give insights into spillage during the filling process and mixture requirements for consistent torch ignition.